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BULLETIN
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Common and Conspicuous Algæ of Montana.

By F. W. Anderson and F. D. Kelsey.

Batrachospermum moniliforme, Roth. Common in cool springs and streams of the mountains and plains throughout the State. Extremely variable in the gross shape, size and color, as well as in microscopic characters. The plant may be found in favorable situations nearly all the year. It arises from a slippery substratum covering the surface of submerged sticks and stones, and mixed more or less evidently with carbonate of lime: this substratum resembles closely to the unaided eye, the expanded, active plasmodium of some myxogaster. The moniliform stems arising from this are usually clustered or gregarious. Specimens, varying from one to ten inches long, and from nearly simple to copiously branched, may be collected in good fruit from May until September, according to locality. The fruit glomerules frequently send out stems which have, under personal observation, grown to a length of nearly two inches, branching several times, and starting whorls of lateral branch nodes, the filaments from which became from one to four cells long. Is it not possible that a fruit glomerule may sometimes separate from the parent plant, drift into a sheltered place and there send out branches which finally develop into a perfect plant, without any further sexual action, while the glomerule itself becomes the thickened foot holding the plant in position? The first three varieties of these species, as given in Wolle's Fresh-Water Algæ, p. 57, may all be found with the type with us, according to the locality, and there seems to be no necessity for their separation.

We may expect to find *B. vagum*, Ag., or one of its forms, as Dr. C. L. Anderson has found a variety in California. Dr.

Anderson said in a letter several years ago to one of the writers, that he had never seen a typical specimen of *B. vagum* from this country, but had specimens from Europe. But Mr. Wolle, in Fresh-Water Algæ, on p. 57, says that typical specimens are to be found in Maine and Canada.

Chantransia violacea, Kg. var. KELSEYI. Anderson, new var. Tufts dense, frequently hemispherical, usually solitary, blackish-green, glossy, drying dull on paper, and fading to dark olivaceous; one to about two lines high. Filaments straight or slightly curved from the base, smooth, dilute green to pale olive green; branches ascending or almost erect, the ends obtuse, frequently rounded and slightly swollen, and occasionally somewhat elongated, 4 8 μ wide, by 33-55 μ long. Fertile branches commonly shorter; carpogons 6-10 μ wide by 10-14 μ long. On the wet wood-work of a mill race, and on stones in shallow water, Great Falls, Montana, March, 1887.*

Enteromorpha intestinalis (Linn.), Link, var. *prolifera,* Ag. Very abundant in the Upper Missouri River, and clear, cold mountain streams tributary thereto. Found in these streams at an altitude of 6,000 feet. At first filamentose, arising from a densely interwoven base formed of similiar threads attached to stones, finally becoming inflated and sparingly branched, rising to the surface and floating in free masses. The individual fronds frequently attain a length of eight feet. May be found all the year, but most abundant in spring and summer. See Wolle's Fresh-Water Algæ, p. 338.

Draparnaldia glomerata, Ag. Abundant in all of our clearer streams and springs, attached to sticks and stones. At first bright green, and forming in roundish masses, firmly attached to the substratum, after the manner of a Nostoc; later becoming watery by the partial dissolution of the amorphorus gelatinous sheathing mass, and floating free on the surface of the water, or caught around the stems or leaves of submerged living plants. June to October.

Draparnaldia plumosa, Ag. A small but remarkably robust specimen was found attached to a small pebble in an arm of the

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*The general appearance of this plant is similiar to that of small specimens of *Tolypothrix pulchra* , Kg., which it was taken to be, until last year, when I had occasion to compare my species of Tolypothrix microscopically, and made this discovery.—A.

furiously flowing Giant Spring on the bank of the Missouri River, near Great Falls. Several main stems arose from a common swollen foot, and branched freely above; a dark sap-green when taken from the water, but drying considerably lighter on paper. This is the only specimen, thus far, reported from Montana, and, like specimens collected by Dr. C. L. Anderson, in California, and others from Connecticut, collected by Dr. W. A. Setchell, it is very distinct in habit of growth and in general appearance from any of our specimens of *D. glomerata*, in which latter the stems and branches are all immersed in a gelatinous substance, more or less firm and dense, according to the age of the plant, which binds them into a glomerule varying from the size of a small pea up to that of an English walnut. In *D. plumosa* the plant has the slippery envelope so modified as to leave every part free, and the general habit of growth in our specimen was similiar to that of reduced forms of *Batrachospermum moniliforme*, but the other specimens referred to were weaker and more diffuse. Giant Spring, banks of the Upper Missouri River, near Great Falls, Montana, September, 1885.

Stigeoclonium tenue, Kg. Habit of growth and general appearance similiar to that of small specimens of *Cladophora callicoma*, but of a brighter green color. Common all over the State. In sheltered nooks it may be found flourishing in winter, but most abundant from the middle of May till the middle of July, and by the end of the month it has pretty well disappeared.

Chætophora pisiformis (Roth), Ag. Found but once and then attached to dead twigs in a pool of cold water, collected from a spring in a dark ravine, at an altitude of about 7,000 feet, in the Belt Mountains, July, 1886. In these specimens, the thallus was half an inch in diameter, and sub-globose.

Chætophora endiviæfolia, Ag. This beautiful species is common all over the State, but especially so in those parts of the Upper Missouri River, and its more sluggish tributaries having muddy bottoms. It grows chiefly in shallow water near the shore, and is at first attached to stones. May be found in winter, but is at its best during July and August.

Cladophora fracta, Kg., var. *gossypina*, Kg. Common in ponds, sloughs, and in slow-flowing spring water somewhat impregnated with alkali. At first attached to the substratum; finally rising and floating free in large, silky, yellowish masses. The individual filaments are very sparingly branched, and *en masse* look more like a *Spirogyra* than like a *Cladophora.* July to September, but at its best in the middle of August.

Cladophora crispata, Kg. Very abundant in shallow ponds and sloughs bordering the Prickly Pear Creek in the Prickly Pear Cañon. Floating in dark green, spongy, elastic masses of less or more curly, interwoven, and much-branched filaments, which spring out to their normal form after the water is squeezed from them, just as sponges do. Collected but once, and then in a luxuriant condition, April 19, 1887.

Cladophora canalicularis, Kg. This common species was collected but once and then at the first rapids of the Great Falls of the Missouri River. The specimens had been cast ashore. They were about ten inches long, strict and rather brittle; the lower half was very dense and compact, being made up of shorter stems and branches arising from the hard, blackish, somewhat calcareous foot. Filaments pale yellow. October, 1886.

Cladophora callicoma, Kg. Plentiful in the rapids of the Upper Missouri River, in the vicinity of the city of Great Falls. This is probably one of the most beautiful species of the genus; but is usually so large and so copiously and intricately branched that a perfect specimen cannot be arranged on a standard-sized herbarium sheet. Forming in ropes three to ten feet long, gracefully undulating in the flowing water and waving its beautiful lateral branches. See Wolle's Fresh-Water Algæ, p. 339. This species was first observed by us in August, 1884—when it was very abundant. Then a dam was built across the river just above the rapids and the disturbance caused the destruction of the plants. In 1886 it reappeared and although excellent specimens were collected as late as October, they did not compare with the luxurient growth of 1884. The plant is now regaining its vigor and may be found in good condition from July until the end of October.

Cladophora glomerata, Kg. Common throughout the state. May be found in good condition from the middle of June till the end of September. The following varieties also occur:

Var. *genuina*, Kirch, is plentiful in all pure, cool, rapid waters of the state; found in the mountain streams, at the altitude of 8,000 feet. Same duration as the species.

Var. FILAMENTOSA, Anders. and Kelsey n. var. Similar to the last but easily distinguished by the more or less numerous elongated simple or sub-simple filaments rising above the other branches and crowned by several to many short-fasciculate to sub-corymbose penicillate branchlets. Plants bright green, 1 to 6 inches high, arising from a calcareous foot, which adheres strongly to the rocky substratum. Cataracts of the Missouri and other rivers of the state; also at Niagara Falls (Wolle), June to October.

Var. *pumila*, Bailey. Frequent on wet wood-work of flumes and races at the city of Great Falls. This pretty little variety grows like a miniature bush, dark green in color, changing with age to a dull dirty green. None of our specimens are over half an inch high. August to November.

Vaucheria sericea, Lyngb. Abundant everywhere. Delights in covering the flat stones and bed-rock of turbulent streams, appearing like big patches of a dense, bright green turf. Also grows in the mud along the margins of springs. All the year round, but at its best from July to December.

Vaucheria sessilis (Vauch), D.C. var. *cæspitosa* (Vauch), Ag. Very common on muddy bottoms of irrigating ditches and on the wet ground bordering creeks and springs. July to October.

Volvox globator, Linn. This curious and beautiful plant is found abundantly in ponds and slow streams throughout the state, all summer.

Protococcus viridis, Ag. and several forms or varieties (?) found everywhere on trees, logs and on the stems of dead herbaceous plants. One form is particularly partial to charred wood of any kind, on which it forms into numerous families by sub-division, appearing like roundish grains or masses of greenish pollen to the unaided eye.

Hydrurus fœtidus (Vill.), Kirch. Very abundant in the Prickly Pear Creek, in Prickly Pear Cañon. Collected but once, April 19, 1887. Specimens vigorous. As many as twenty-seven distinct main stems were counted rising from a common disk of attachment. Plants from six to eighteen inches long, olivaceous, very slippery and of a rank odor—like some of the offensively strong-smelling marine algæ. Flavor like kelp, but stronger and nauseating.

Var. *Ducluzelii*, Ag. has been found only in the Giant Spring, near Great Falls. The first specimens were collected September 28, 1885, in a very rapid arm of the spring. They were plentifully attached to imbedded stones. The largest specimen was three and a half inches high and none have been found so large since; the average height seems to be from an inch and a half to two inches; very dark green and olive-tinged, which shows more decidedly in dried specimens. This plant seems to appear only every other year; from August to October.

In connection with this form attention is called to page 337 of Wolle's Fresh-Water Algæ of the United States, whereon is mentioned a plant that might possibly be a form of *Gelidium corneum*, Lam. Only a scanty supply was collected, although it was fairly abundant at the time. This form has been carefully examined by Drs. Setchell and Farlow and by us, and the conclusion now is that it is merely a condition of *H. fœtidus* var. *Ducluzelii*, in which the lateral branches, usually so liberally clothing the main stem, have not been developed. The microscopic structure of the two forms is practically the same.

TETRASPORA GIGANTEA, Anders. and Kelsey, n. sp. Thallus attached to stones by the attenuate base, tubular or sometimes filled with an amorphous semi-fluid jelly which contains a few cells or none; cylindrical; end slightly tapering and rounded, or extended gradually into a long, slender, rounded point, one-eighth of an inch in diameter; one to ten feet long, diameter from a slender thread to an inch and a half in the broad part, according to length and age of thallus: Cells 10–17μ diameter, average size about 16μ. Thallus bright green, becoming dilute green with age, smooth, very slippery, and easily ruptured.

This species differs from *Tetraspora cylindrica*, Ag. in its much greater size, in its remarkably conspicuous, gregarious habit, in the attenuate base and rounded apex and in the tendency to form cells throughout the diameter of the thallus as well as in having for a constant habitat the swift, turbulent mountain streams. The diameter of the cells is about the same in both, sometimes a little larger in ours, but the other features are so different that we feel safe in describing it under the foregoing name. Belt River in the cañon and in other streams of the Belt mountains and main range of the Rockies, from 5,000 to 8,000 feet altitude. June to September. See Wolle's Fresh-Water Algæ of the United States, p. 339.

T. GIGANTEA var. SOLIDA, Anders. and Kelsey n. var.

Thallus firmly attached by a broad or rarely narrowed base, usually tapering from the base to the blunt point; firm, solid throughout, or hollow only below, pliable and slightly elastic, can be cut in slices with a penknife, and can be carried in the hand and trailed along the ground like a quirt; usually covered outside with silica or possibly fine sand; glaucus outside, dark green inside and paler towards the centre, where the cells are not so crowded; one to six feet long, with a diameter of one inch or less at the base.

This remarkable alga invariably grows on flat bed rock in the "dead water" just below the ripples, and near the edge of the stream. Like the species, may be found from June to September; Belt River, in the cañon, Belt Mountains.

Tetraspora cylindrica, Ag. Occasionally found in rills from slow-flowing springs. Slender, attenuate pointed, six inches to a foot long, bright green, slippery; often attached to dead submerged twigs. July to October.

Tetraspora lubrica, Ag. Very common in quiet springs and slow streams throughout the State. A quite variable species. June to October.

Spirogyra quinina (Ag.), Kg. Common everywhere in a vegetative condition, all the year round. We have neither caught it in conjugation nor in fruit as yet.

Zygnema insigne, Kg. Common in stagnant and slow waters. Abundantly conjugating and fruiting in September, when it is floating in dirty, yellowish, frothy masses.

Zygnema peliosporium. Common on dripping rocks and on the margins of cold, shaded springs. Fruits abundantly in November. A beautiful species.

Glœotrichia pisum, Thur. Common in Sand Coulee Creek on the leaflets of *Myriophyllum spicatum*, L. Doubtless occurs throughout the State. August to October.

Tolypothrix distorta, Kg. Everywhere in flowing water, growing cæspitose on the rocks. Filaments of our specimens measure 12–20 μ diameter. July to October.

Tolypothrix pulchra, Kg. Common as the last; on dripping rocks and on wet wood-work of dams, flumes and the like, submerged twigs, etc., in springs and streams. July to October.

Nostoc muscorum, Ag. Abundant on moss under dripping rocks.

Nostoc calcicola, Ag. Plentiful on the rocks at the "Great Fall" of the Missouri, which are kept constantly wet by the drifting spray.

Nostoc commune, Vauch. Common throughout the State. On the high foot-hills (5,000 to 7,000 ft.), on the alkaline plains and in the valleys. Extremely variable; in innudated places, where the water is kept warm by the sun's rays, this nostoc grows with marvelous rapidity, and frequently attains a diameter of ten inches and half a inch in thickness.

Nostoc sphæricum, Vauch. This small species is particularly partial to damp rocks in shady ravines.

Nostoc verrucosum, Vauch. Common at the Falls of the Missouri and in spring water impregnated with lime. In the fall of the year this species is torn from its hold on submerged rocks in the upper Missouri River, rises to the surface and floats to the shore in large numbers. Sometimes watery, hollow specimens, the size of bantam eggs are picked up. This species seems to take the place of *N. pruniforme*, Ag., with us.

Nostoc flagelliforme, Berk. & Curt. Very common on the alkali plains about Helena and thence southward and westward. As one walks carelessly along, this curious *Nostoc* looks like small weather-beaten, entangled tufts of black horse hair. Hitherto only reported from Texas. See Wood's "Contributions," p. 226, and Wolle's "Fresh-Water Algæ," p. 285. This species is so very distinct from all other known species that it could never be mistaken for any of them. It is frequently in company with the plains form of *N. commune*.

Sphærozyga polysperma. Common in open, muddy pools heated by the sun's glare; rising to the surface in small frothy, scummy masses. Ponds and semi-stagnant mud-bottomed parts of streams in the mountains and on the plains. June to November.

Cylindrospermum macrospermum, Kg. Common throughout; same general habit and duration as the last.

Leptothrix calcicola, Kg. Stratum dull æruginous, or dull ferruginous. Common everywhere on damp or dripping rocks. All the year.

Leptothrix æruginea (Kg.), Kirch. Doubtless common; but collected but once covering the sides of a large glass jar filled with spring water and left standing in the window for several weeks. The filaments formed a dense film. The side applied to the glass was somewhat variable, being bluish, faintly purplish or glaucous green; the other side was a very rich green. August, 1886.

In the waters of Montana diatoms are very numerous; not so much perhaps in number of species as in the vast and very palpable aggregate of individuals. They often cover such plants as *Cladophora* so completely as to obscure the character of their hosts, while even in mountain torrents, the boulders and lesser stones are covered with them so as to render the fording of a stream a slippery and, at times, even a dangerous task. Prof. C. Henry Kain has kindly examined our scanty collection in this branch. The following species are common and interesting:

Synedra ulna (Nitzsch.), Ehr. On or with *Spirogyra* and *Zygnema*, sp.; very common.

Cymbella gastroides, Kutz. Very common in cold, rapid streams, forming hemispherical, slippery, gristle-colored masses, with myriads of minute diamonds flashing on all sides when the sun shines clearly.

Fragilaria capucina, Desmaz., is also very commonly mixed with foregoing species. The entire list reported by Prof. Kain is as follows:

Synedra ulna (Nitzsch.), Ehr.

Synedra (*ulna*, var.) *Danica*, Kutz.

Meridion constrictum, Ralfs.; some specimens are quite near to *M. circulare.*

Diatoma hiemale (Lyng.), Heiberg, var. *mesodon*, Grun.

Melosira varians, Agardh.

Cymbella gastroides, Kutzing.

Cymbella cymbiformis, Ehr.

Cymbella cistula, Hempr.
Cymbella lanceolata, Ehr.
Encyonema ventricosum, Kutzing.
Eunotia lunaris (Ehr.), Grun., var. *excisa*, Grun.
Surirella angusta, Kutz.
Gomphonema acuminatum, Ehr.
Gomphonema Herculaneum, Ehr.
Gomphonema ventricosum, Greg.
Rhoicosphenia Van Heurckii, Grun.
Cocconeis pediculus, Ehr.
Cocconeis placentula, Ehr.
Epithemia turgida (Ehr.), Kutz.
Navicula varians, Greg.
Fragilaria capucina, Desmaz.

In concluding this article it were not well to forget the constant courtesy and practical assistance rendered us from time to time since 1885 by our venerable friend, the Rev. Francis Wolle, and by Dr. Wm. Albert Setchell, who have each done much towards determining our humble collections of Montana algæ, and towards encouraging our work in a region where all discouragement possible, until very recently, has been perpetually cast in our way.

Myriophyllum Farwellii, nov. sp.

BY THOMAS MORONG.

A few months since Mr. O. A. Farwell, of Ypsilanti, Mich., sent to the Herbarium a specimen of *Myriophyllum*, collected in a small pond in Keweenaw County, Mich., which without much examination was referred to the form named by T. and G. *M. ambiguum*, var. *capillaceum*. A subsequent study of the specimen convinced me that in some particulars it was distinct from anything hitherto published, and a more complete suite of plants sent recently by Mr. F. has confirmed my impression. It more nearly resembles *M. pinnatum* (Walt.), (*M. scabratum*, Mx.) in the flowers and fruit than any other North American species, but it is sufficiently different both in habit and botanical characters to merit specific rank. The stems are all submerged, and the flowers produced in their axils under water. Mr. F. writes that although quite abundant and frequently much longer than the depth